

XXII.

National Library of Medicine

INTRODUCTION

Fiscal year 2000 (FY 00) saw continuing international leadership by the National Library of Medicine (NLM) to further global Internet connectivity. The DOCLINE program was expanded to include libraries in Africa. NLM also expanded Internet communications connectivity and access to information resources for malaria researchers in Africa, as part of the Multilateral Initiative on Malaria (MIM). MIM is a major initiative undertaken in collaboration with the National Institute of Allergy and Infectious Diseases (NIAID); the John E. Fogarty International Center for Advanced Study in the Health Sciences; and the Office of the Director, National Institutes of Health (NIH).

Other international activities were carried out with individual countries and governmental and nongovernmental organizations. Information management training was provided to colleagues from abroad, numerous professional visitors were received from around the world, and publications were exchanged with libraries in other countries.

Long-range Planning

The increasing globalization of knowledge has made it clear that the domestic and international functions of NLM are not separable. A network of International MEDLARS Centers has grown over the years to 20 members, and the scope of their work must reflect changing needs. In 1998, the Library published "A Global Vision for the National Library of Medicine," a supplement to the long-range plan that charted an international course for the institution in the coming years.

NLM has completed a new Long-range Plan 2000–2005 with a major objective to promote the development of the global health information infrastructure. The new plan lays out specific program plans in connectivity and communications, document

delivery, institutional relationships, and training for NLM's international programs.

Connectivity and Communications

In the area of connectivity and communications, NLM has the following goals:

- to develop a capability to work in a few carefully selected areas of need in the world where there are recent, severe health emergencies and to collaborate with efforts of other domestic and international organizations to set up targeted, carefully defined efforts (e.g., NLM participation in MIM);

- to broaden and enhance NLM's efforts to improve Internet connectivity and communications in sub-Saharan Africa; and

- to expand high-bandwidth connectivity testing internationally and to include protocols for connections with very high speed, backbone network service, in addition to the current Internet.

Document Delivery

NLM will assist the development of effective document delivery mechanisms for international MEDLINE users by the following actions:

- promote regional networks in areas that lack effective mechanisms for document delivery;

- work with international libraries to improve access to copies of specific articles for international MEDLINE users;

- make low-cost technology for image transfer (e.g., DocView) available to international libraries and institutions, to facilitate rapid and economical delivery of documents from NLM and other U.S. libraries; and

- increase representation in MEDLINE for foreign journals containing useful global information, including reports on local and regional health problems.

NLM has added selected international libraries to DOCLINE and Loansome Doc, to facilitate access to documents for international MEDLINE users. DOCLINE is NLM's automated interlibrary loan request and

referral system. Its purpose is to provide document delivery service to health professionals by rapidly routing interlibrary loan requests among libraries in the National Network of Libraries of Medicine. Loansome Doc is a feature of PubMed and Internet Grateful Med that enables users to order documents found in MEDLINE. It is available to users in the United States and any foreign country. From PubMed or Internet Grateful Med, a user can have articles from a list of retrieved citations sent to a library that will supply full-text documents.

Institutional Relationships

NLM will use the following strategies to promote productive institutional relationships:

- investigate the feasibility of exploiting current information technology to assist developing countries in accessing the world's sources of health care knowledge;

- explore ways to encourage collaborative arrangements between U.S. and foreign institutions to promote sharing of resources and staff training; and

- emphasize international partnerships in this hemisphere, for purposes such as provision of surveillance, emergency disaster relief, and toxicological and environmental health information.

Training

NLM will continue to investigate new options for providing informatics training in geographic areas that lack training programs.

International DOCLINE Libraries

Under another NLM project, researchers in Central, Eastern, and Southern Africa have been able to request documents and journal articles on malaria through the medical libraries at the University of Zimbabwe, Harare, and the South African Medical Research Council. Their requests are filled as quickly as possible, either locally or at NLM, by electronic mail (e-mail), fax, or airmail. This service is provided free, as part of a

pilot program at NLM (MIMCOM), which is funded by the MIM Communications Working Group (CWG). Target countries for the University of Zimbabwe medical library are Ghana, Kenya, Malawi, Tanzania, Uganda, Zambia, and Zimbabwe. Target countries for the medical library of the South African Medical Research Council are Angola, Botswana, Mozambique, Namibia, South Africa, and Swaziland.

This service is intended to serve malaria researchers with a range of technological capabilities. Those with Internet access to the World Wide Web can search MEDLINE via NLM's free PubMed service (http://www.ncbi.nlm.nih.gov/pubmed/). During an online search, investigators can select journal references relating to malaria research and then request these references electronically by using the Loansome Doc feature of PubMed. For some journals, the full text of references can be obtained directly online (e.g., *British Medical Journal*). Documents can also be sent by fax or airmail to researchers, especially those who have no reliable e-mail connection or who prefer paper copies of documents. Malaria researchers with access to the Web are invited to use MIMCOM's web site of resources and links for malaria research (<http://www.mimcom.net>).

Global Internet Connectivity

NLM has completed phase II of its end-to-end Internet connectivity testing and evaluation project. This project was intended to explore the methods and measurements needed to better understand the quality of Internet performance from the perspective of the end user. To do this, NLM used test methods that measure, for example, the size of the Internet transmission "pipe," the time for sending packets of information to the destination and back, the percentage of packets lost during transmission, and response time.

HIGHLIGHTS OF RECENT SCIENTIFIC ADVANCES RESULTING FROM INTERNATIONAL ACTIVITIES

Internet Connectivity at Malaria Research Sites in Africa

"I vividly remember the first meeting we held at the National Library of Medicine during January 1998, when I presented a proposal for Internet connectivity for both Amani and Ifakara Centres [in Tanzania].

Yes, this is a dream come true. I'm sure it will mean a lot to the researchers at both centres and their collaborators worldwide, given their previous isolation. They can now enjoy virtual communication with the world scientific community. Keep it up!"

These are the words of Dr. Wenceslaus Kilama, chair, African Malaria Vaccine Testing Network, on the installation of NLM's telecommunications system for malaria researchers in Tanzania.

NLM continues to lead MIM's CWG, which was begun in 1997. The objectives are to support African scientists and to increase the ability of malaria researchers to connect with one another and with sources of information, through full access to the Internet and the resources of the Web. Key to achieving these objectives are affordable and reliable information and communication links and strong partnerships with governmental and international nongovernmental organizations.

The initial meeting of the MIM CWG was held at NLM, in Bethesda, Maryland, in January 1998. In attendance were malaria research scientists, health information professionals, telecommunications experts, and representatives of the major agencies that fund MIM programs and activities. In keeping with the underlying goal of supporting a broad spectrum of basic and operational needs in malaria research, the investigators requested communications and connectivity capabilities sufficient to provide, at a minimum, robust and reliable e-mail capability; links among research sites; access to the full text of journal articles; database searching; exchange of large files and mapping data; and timely access to electronic information resources worldwide. To meet these needs in remote areas, NLM chose to implement a VSAT (very small aperture terminal) system, which comprises a ground station, a geostationary satellite, and a downlink in the United Kingdom. For less remote areas, a microwave system that uses radio waves was selected.

In July 1999, NLM's technical team and Redwing Satellite Solutions, Ltd., (United Kingdom) successfully installed VSAT ground stations at two research sites in Kenya. Scientists and researchers at the Centers for Disease Control and Prevention and Kenya Medical Research Institute (KEMRI), in Kisumu, and the Wellcome Trust and

KEMRI, in Kilifi, were then able to connect with their colleagues and sources of information all over the world. At one site, the number of computers has doubled and telephone and fax charges have been cut by two-thirds. One of the principal researchers refers to his "virtual office."

The NLM team subsequently installed one station in Kenya and two in Ghana. The station in Nairobi, Kenya, was funded by Walter Reed Army Institute of Research, Washington, D.C., and is shared by the Centers for Disease Control and Prevention, KEMRI, the Wellcome Trust, the Japan International Cooperation Agency, and the regional office of the U.S. Library of Congress. The stations in Ghana are at Noguchi Institute, in Accra, and at Navrongo Health Research Center, a remote site in northern Ghana. The sites in Ghana are engaged in testing of a malaria vaccine, which is funded jointly by NIAID (NIH), the U.S. Naval Medical Research Center, and the U.S. Agency for International Development (USAID).

The most recent sites were installed in Tanzania at remote locations, in Ifakara and Amani. The only road to Ifakara, which does not have a single telephone, is impassable during the rainy season. The Amani center, located on a hillside 1,000 meters above sea level, has just one telephone—a hand-cranked type that works sporadically. Telecommunications will play a major role at both sites.

NLM has worked with the vendor Redwing Satellite Solutions, Ltd., to create a consortium of user sites in which members share use of bandwidth at an affordable and sustainable price. The advantage of the group arrangement is reduction in the cost per site to an affordable level. In addition, the consortium approach allows NLM to have flexibility in adjusting bandwidth to fit the needs of each site.

NLM plays the critical role of facilitator, system designer, network implementer, and supporter, and funding partners pay for equipment and monthly operations. NLM continues to provide technical support to all sites on the network; to carry out site visits, assessments, and installations; and to address related issues of user training, in-country licensure of technology, and allowances for future technological advances.

NLM has created a web site for researchers (www.mimcom.net) and an information

technology training program, which held a workshop for all site information technology administrators in October 2000.

Through this program, NLM continues to build and deepen research and funding partnerships with various research agendas within the Federal Government. Those that involve NIAID (NIH) include (a) the Antimalarial Drug Resistance Network and (b) Severe Malaria in African Children, both of which are multicountry efforts that cannot be carried out without the network NLM has established.

NLM is producing a thorough technical documentation of the system, as well as gathering reports of how researchers are using the system and how its use is improving their research. An investigator at KEMRI speaks of his isolation before he had full access to the Internet and the resources of the Web. The investigator has now published an article entitled "Climate change and vector-borne diseases: a regional analysis" (*Bulletin of WHO*), edited a book, and feels that he has the respect of colleagues in Europe and the United States.

SUMMARY OF INTERNATIONAL PROGRAMS AND ACTIVITIES

Activities With International and Multinational Organizations

International Council for Scientific and Technical Information

As a member institution of the International Council for Scientific and Technical Information, a component of the International

Council of Scientific Unions, NLM collaborated with international journal publishers and database providers in a variety of technical projects and policy initiatives in FY 00. These included definition of the electronic journal publication of the future, as well as standards and technologies needed to preserve the digital archival record of science, technology, and medicine.

G7 and G8 Global Healthcare Applications Projects

Health is 1 of 11 theme areas identified for study by President Bill Clinton and his counterparts in the G7 nations, to demonstrate the value of information technology in addressing social needs.

NLM led a project activity premised on the notion that many G7 Global Healthcare Applications projects depend in whole or in part on the availability of the Internet. As the preferred technical means for the exchange of biomedical information with and among the G7 nations and beyond, the Internet is a critical component of the emerging global health information infrastructure. NLM, in conjunction with G7 countries and other domestic and international partners, has successfully concluded an Internet testing study that improves understanding of Internet connectivity from the user's perspective and better informs users about selecting Internet services and solving problems in use of the Internet. NLM identified a need for objective and widely accepted methods of characterizing and diagnosing the quality and performance of Internet

connections under various conditions (e.g., locations, distances, time periods, and data volumes). An important finding has emerged: local bottlenecks, rather than inadequate bandwidth on the international links, are the primary source of most congestion problems on the Internet. The results of this research were published in the *Journal of the American Medical Informatics Association*, as noted previously, and will also be published in 2001, in *The G-8 Global Healthcare Applications Project Reports—Recommendations for the Way Into the Information Society*.

International Visitors

NLM continues to be a focal point for visitors of the international community from a variety of disciplines. Many of these visitors are responsible for medical, scientific, or technical information in their own countries. Visitors are officially received and briefed on relevant aspects of NLM operations and research. Visitors in FY 00 came from Australia, Belarus, Belgium, Brazil, Canada, Chile, China (including Hong Kong), Colombia, Croatia, Denmark, Egypt, England, France, Georgia, Germany, Hungary, India, Iran, Israel, Italy, Jamaica, Japan, Korea, Malawi, Mali, Mexico, Nigeria, the Philippines, Poland, Portugal, Romania, Russia, Saudi Arabia, Singapore, Slovenia, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Thailand, Tunisia, Turkey, Zimbabwe, and Taiwan.